



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/724,092	12/01/2003	Akira Nagai	503.35443CC4	1404

20457 7590 01/24/2006

ANTONELLI, TERRY, STOUT & KRAUS, LLP
1300 NORTH SEVENTEENTH STREET
SUITE 1800
ARLINGTON, VA 22209-3873

EXAMINER

DOTY, HEATHER ANNE

ART UNIT PAPER NUMBER

2813

DATE MAILED: 01/24/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/724,092

Applicant(s)

NAGAI ET AL.

Examiner

Heather A. Doty

Art Unit

2813

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 November 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1, 2, 4, 5, 7-11, 13-15, 17-20 and 22-35 is/are pending in the application.
- 4a) Of the above claim(s) 17, 18, 30 and 31 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 24, 25, 34 and 35 is/are allowed.
- 6) ☒ Claim(s) 1, 2, 11, 13, 19, 20, 26, 28 and 32 is/are rejected.
- 7) ☒ Claim(s) 4, 5, 7-10, 14, 15, 22, 23, 27, 29 and 33 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 01 December 2003 is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☒ Certified copies of the priority documents have been received in Application No. 08/857,674.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Double Patenting

The terminal disclaimer filed 11/10/2005 has overcome the double-patenting rejections of claims 1-3, 6, 8-10, 24, and 25 made in the Office action dated 5/12/2005. The rejections are therefore withdrawn.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless – (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 19, 20, and 32 are rejected under 35 U.S.C. 102(b) as being anticipated by Akikuni et al. (JP 6-236906) with Freyman et al. (U.S. 5,646,451) providing typical wire bonding temperatures, relevant to claim 20.

Regarding claim 19, Akikuni et al. teaches an adhesive film, which is for adhering a semiconductor element to circuit tape, having an elastic modulus, in a range of mounting reflow temperature for mounting the semiconductor element onto a mounting substrate, of more than 1 MPa, and an elastic modulus of said adhesive film at room temperature is equal to or less than 4000 MPa (see drawing 3; 1MPa = 10^7 dyne/cm²).

The recitation “adapted to be used in ball grid array semiconductor devices, which is for adhering a semiconductor element to circuit tape” has not been given patentable weight because the recitation occurs in the preamble. A preamble is generally not accorded any patentable weight where it merely recites the purpose of a process or the intended use of a structure, and where the body of the claim does not

depend on the preamble for completeness but, instead, the process steps or structural limitations are able to stand alone. See *In re Hirao*, 535 F.2d 67, 190 USPQ 15 (CCPA 1976) and *Kropa v. Robie*, 187 F.2d 150, 152, 88 USPQ 478, 481 (CCPA 1951).

Regarding claim 20, Freyman et al. teaches that a typical wire bonding temperature is 225°C (column 1, lines 32-34), within the claimed ranges of reflow temperature and temperature for elastic modulus of the adhesive film.

Regarding claim 32, the recitation "wherein said circuit tape includes pads for electrical connection thereto by a ball grid array connection" further limits the preamble of claim 19, which, as presently written, does not have patentable weight.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 2, 11, 13, 26, and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al. (U.S. 5,620,928) in view of Akikuni et al. (JP 6-236906).

Regarding claims 1 and 2, Lee et al. teaches a circuit tape with an adhesive film, adapted to be used in ball grid array semiconductor devices, comprising a circuit tape having a base material made of a dielectric film, whereon a circuit is formed (**84** in Fig. 4A; column 2, lines 56-62); and an adhesive film for connecting said circuit tape to a semiconductor element and an adhesive layer for connecting said circuit tape to a semiconductor element (**87** in Fig. 4A; column 6, lines 11-13).

Lee et al. does not expressly teach that the adhesive film insulates the circuit tape from the semiconductor element, that the elastic modulus of said adhesive layer, in a range of mounting reflow temperature for mounting the semiconductor element onto a mounting substrate, or in the range of 200°C - 250°C, is more than 1MPa, and an elastic modulus of said adhesive film at room temperature is equal to or less than 4000 MPa.

Akikuni et al. teaches an insulating adhesive film for semiconductor device packaging with an elastic modulus in a range of mounting reflow temperature for mounting a semiconductor element onto a mounting substrate (200-250°C) of more than 1 MPa and an elastic modulus at room temperature equal to or less than 4000 MPa (see drawing 3, 1MPa = 10^7 dyne/cm²).

Therefore, at the time of the invention, it would have been obvious to one of ordinary skill in the art to modify the circuit tape with an adhesive film taught by Lee et al. by using the adhesive film taught by Akikuni et al. to connect the circuit tape to a semiconductor element. The motivation for doing so at the time of the invention would have been because this adhesive film does not corrode at high temperatures, as taught by Akikuni et al. (abstract).

Regarding claims 11 and 13, Lee et al. teaches a circuit tape with an adhesive film, adapted to be used in ball grid array semiconductor devices, comprising: an elongated circuit tape having a base material made of dielectric film, whereon circuits are formed (84 in Fig. 4A; column 2, lines 56-62); and at least one adhesive film each

Art Unit: 2813

adhered continuously to said circuit tape, each adhesive film having a size less than that of the elongated circuit tape (**87** in Fig. 4A).

Lee et al. does not expressly disclose that the adhesive film has an elastic modulus, in a range of mounting reflow temperature for mounting a semiconductor element onto a mounting substrate, or the range of 200 °C - 250°C, is more than 1MPa, or that an elastic modulus of said adhesive film at room temperature is equal to or less than 4000 MPa.

Akikuni et al. teaches an adhesive film for semiconductor device packaging with an elastic modulus in a range of mounting reflow temperature for mounting a semiconductor element onto a mounting substrate (200-250°C) of more than 1 MPa and an elastic modulus at room temperature equal to or less than 4000 MPa (see drawing 3, 1MPa = 10^7 dyne/cm²).

Therefore, at the time of the invention, it would have been obvious to one of ordinary skill in the art to modify the circuit tape taught by Lee et al. by using the adhesive film taught by Akikuni et al. to connect the circuit tape to a semiconductor element. The motivation for doing so at the time of the invention would have been because this adhesive film does not corrode at high temperatures, as taught by Akikuni et al. (abstract).

Regarding claims 26 and 28, together Lee et al. and Akikuni et al. teach the circuit tape with an adhesive layer as claimed in claims 1 and 11. Lee et al. further teaches that said circuit tape includes pads for electrical connection thereto by a ball grid array connection (wires **72** connected to solder balls in Fig. 4A).

Allowable Subject Matter

Claims 4, 5, 7-10, 14, 15, 22, 23, 27, 29, and 33 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 24, 25, 34, and 35 are allowed.

The following is a statement of reasons for the indication of allowable subject matter:

Regarding claims 4, 5, 7, 14, 15, 22, 23, 27, 29, and 33, reasons for the indication of allowable subject matter are addressed in the Office action dated 5/12/2005.

Regarding claims 8 and 9, prior art does not teach or suggest, in combination with the other claimed limitations, an adhesive film having an elastic modulus in a range of mounting reflow temperature for mounting the semiconductor device of more than 1MPa, and an elastic modulus at room temperature of equal to or less than 4000 MPa, and additionally either a layer of thermoplastic resin with a glass transition temperature greater than 250 °C or a coefficient of moisture absorption at 85 °C/85% for 168 hours of, at most, 3%.

Regarding claim 10, prior art does not teach or suggest, in combination with the other claimed limitations, an adhesive film having an elastic modulus in a range of mounting reflow temperature for mounting the semiconductor device of more than

1MPa, and an elastic modulus at room temperature of equal to or less than 4000 MPa, that fills in the spaces in an uneven surface of the circuit tape.

Regarding claims 24, 25, 34, and 35, prior art does not teach or suggest, in combination with the other claimed limitations, a thermosetting resin closest to the circuit tape and a thermoplastic resin closest to the semiconductor element.

Response to Arguments

Applicant's arguments filed 11/10/2005 have been fully considered but they are not persuasive.

Regarding the Akikuni et al. reference, Applicant argues that Akikuni et al. discloses only the elastic modulus of the adhesive layer only, and not the entire film (see p. 16). However, this argument is not persuasive because the tape disclosed by Akikuni et al. has the specific purpose of adhering semiconductor devices in TAB processing at elevated temperatures (paragraph 0004), such as those needed for mounting a semiconductor element onto a mounting substrate. Drawing 3 is a graph of the elastic modulus of the adhesive film for a range of temperatures spanning room temperature to 300 °C. At room temperature, the elastic modulus is less than 4000 MPa ($1\text{MPa} = 10^7 \text{ dyne/cm}^2$) and in a temperature range of 200°C - 250°C, the elastic modulus is more than 1 MPa. Since the novelty of the invention disclosed by Akikuni et al. relies upon the elastic modulus of the adhesive film, it would not make sense for Akikuni et al. to add layers to the adhesive that would destroy the usefulness of the tape. Akikuni et al. discloses their invention as having an elastic modulus as claimed in claim 1 over a temperature range claimed in claim 1. Therefore there is no reason to

believe that the additional layers disclosed by Akikuni et al. negatively affect the utility of the invention. Additionally, claim 1 contains no limitation limiting the number of layers of the adhesive film.

Applicant additionally argues (see p. 15) that the Examiner erred in not giving patentable weight to the phrase "adapted to be used in ball grid array semiconductor devices, which is for adhering a semiconductor element to circuit tape." However, the Examiner respectfully disagrees. Claim 19 includes no limitation that specifies how the adhesive film is adapted to be used in ball grid array semiconductors. Based upon the content of the claim, one does not know how the claimed adhesive tape differs from an adhesive tape intended for use in any other type of semiconductor package. Therefore, since the phrase appears only in the claim preamble, it is correct not to give it patentable weight, as argued above.

Arguments regarding the Nakayoshi et al. reference and combinations of Lee et al. and Nakayoshi et al. are moot, in view of the new ground(s) of rejection necessitated by Applicant's amendments to the claims.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Morita et al. (U.S. 5,406,124) discloses an insulating adhesive tape for a lead frame that comprises a thermoplastic polyimide with a glass transition temperature ranging from 180 °C to 280 °C, and an elastic modulus ranging from 10^{10} dyne/cm² to 10^{11} dyne/cm² at 25 °C., and an elastic modulus of 10^2 dyne/cm² to 10^9 dyne/cm² at a temperature between 250 °C. and 300 °C.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

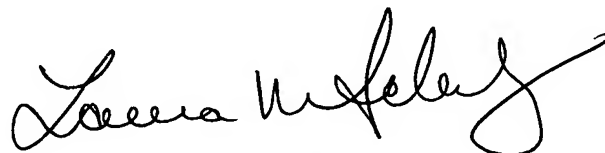
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Heather A. Doty, whose telephone number is 571-272-8429. The examiner can normally be reached on M-F, 8:30 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr., can be reached at 571-272-1702. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

had

A handwritten signature in black ink, appearing to read "Laura M. Schillinger", with a stylized, flowing script.

LAURA M. SCHILLINGER
PRIMARY EXAMINER